



Hardware Installation Guide for the QLA1xxx Boards

Parallel SCSI Host Adapter Boards
for the PCI Bus

PC0056105-00 F
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Quick Installation Instructions

NOTE: The following QLogic host adapter boards are collectively referred to as the *QLA1xxx board* unless otherwise noted:

QLA1040 (wide, single-ended, Ultra)
QLA1041 (wide, differential, Ultra)
QLA1080 (wide, low voltage differential [LVD], Ultra2, 64-bit PCI)
QLA1240 (wide, single-ended, dual port, Ultra, 64-bit PCI)
QLA1240D (wide, differential, dual port, Ultra, 64-bit PCI)
QLA1280 (wide, LVD, dual port, Ultra2, 64-bit PCI)

Using These Instructions

Before installing your QLA1xxx board, take a moment to read this instruction guide. These instructions are a condensed version of the instructions in section 2.

Termination for the QLA1xxx boards is set automatically in most cases. See appendix A for details. See appendix B for termination instructions for the QLA1041/1240D boards, and manual termination instructions for the QLA1080/1240/1280 boards.

What You Need for Installation

- ☐ A screwdriver (usually a Phillips #1)
- ☐ One or more of the following cables

QLA1xxx Board	Internal		External	
	Narrow	Wide	Narrow	Wide
QLA1040	50-pin to 50-pin	68-pin to 68-pin	68-pin to 50-pin	68-pin to 68-pin
QLA1041				
QLA1240	68-pin to 50-pin		68-pin VHDC to 50-pin	68-pin VHDC
QLA1240D ^a	N/A	N/A		
QLA1080	68-pin to 50-pin	68-pin to 68-pin		
QLA1280				

Table Notes

All cables are SCSI-2, high density unless otherwise noted.
The 68-pin connectors are high density or very high density (VHDC) unless otherwise noted.

^aThe 1240D board supports only external connectors.

Installing Your QLA1xxx Board

CAUTION! The QLA1xxx boards contain parts that can be damaged by electrostatic discharge (ESD). Before handling the QLA1xxx board, use standard methods to discharge static electricity. Keep the QLA1xxx board in the antistatic bag until you are ready to install it. Place the board on the bag when you examine or configure it. Retain the bag for future use.

- ☐ Check the motherboard and make any configuration changes necessary to accommodate the QLA1xxx board.
- ☐ Power down your peripheral devices, then your computer.
- ☐ Remove the computer cover.
- ☐ Install the QLA1xxx board in an appropriate PCI (32 or 64 bit) slot.
- ☐ Connect the appropriate SCSI peripheral cables. Make sure that pin 1 on the 50-pin internal connector is matched with pin 1 (colored stripe) on the ribbon cable (QLA1040/1041/1240 boards).

CAUTION!

- ☐ You can use any two of the connectors on the QLA1040/1041 boards (see figures 2-1 and 2-2). Using all three connectors violates the SCSI specification and can cause your peripheral devices to operate incorrectly.
- ☐ If the QLA1080/1280 boards are on a SCSI bus with any single-ended peripheral device, for example, a CD-ROM, the QLA1080/1280 boards automatically operate as a single-ended, Ultra device. Consequently, all single-ended device restrictions apply to the QLA1080/1280 boards, even though they are LVD devices (see table 3-1 and appendix C).
- ☐ Replace the computer cover.
- ☐ Power up the peripherals, then the computer.

Congratulations! You have successfully installed your new QLA1xxx board. See the appropriate QLA1xxx software installation guide for information about the software drivers for the QLA1xxx board.

Section 1

Introduction

NOTE: The following QLogic host adapter boards are collectively referred to as the *QLA1xxx board* unless otherwise noted:

QLA1040 (wide, single-ended, Ultra)
QLA1041 (wide, differential, Ultra)
QLA1080 (wide, low voltage differential [LVD], Ultra2, 64-bit PCI)
QLA1240 (wide, single-ended, dual port, Ultra, 64-bit PCI)
QLA1240D (wide, differential, dual port, Ultra, 64-bit PCI)
QLA1280 (wide, LVD, dual port, Ultra2, 64-bit PCI)

1.1 Product Description

The QLA1xxx board is an intelligent, high-performance, direct memory access (DMA) bus master small computer system interface (SCSI) host adapter designed for high-end systems. The intelligence and performance are derived from the ISP chip, making the QLA1xxx board a high performance host adapter. The ISP chip combines a powerful RISC processor, a SCSI executive processor (SXP) (the ISP1240/1280 chips have two), and a peripheral component interconnect (PCI) local bus interface in a single-chip solution. The QLA1xxx board supports bootable devices (hard drives and compact disc-read only memory [CD-ROM] drives) and can be used with tape drives and other SCSI devices. Installation of the QLA1xxx board is quick and easy.

The QLA1080/1240/1240D/1280 boards are for use only with UL listed computers that have detailed instructions for user installation of accessory cards.

The QLA1xxx boards are designed to operate with multiple data transfer speeds under SCSI specifications (see table 1-1).

Table 1-1. SCSI Data Transfer Rates

SCSI Mode	Maximum Data Rate Narrow (8-bit)	Maximum Data Rate Wide (16-bit)
SCSI (or parallel SCSI)	5 Mbytes/sec (Asynchronous)	—
Fast SCSI	10 Mbytes/sec	20 Mbytes/sec

Table 1-1. SCSI Data Transfer Rates (Continued)

SCSI Mode	Maximum Data Rate Narrow (8-bit)	Maximum Data Rate Wide (16-bit)
Ultra SCSI	20 Mbytes/sec	40 Mbytes/sec
Ultra2, LVD SCSI (QLA1080/1280 boards)	40 Mbytes/sec	80 Mbytes/sec

NOTE:

- ❑ To achieve Ultra transfer speeds, you must have Ultra SCSI devices connected to your QLA1xxx board.
- ❑ To achieve Ultra2 (LVD) transfer speeds, you must have only Ultra2 SCSI devices connected to your QLA1xxx board.

Ultra and Ultra2 SCSI host adapter boards can connect computers to other computers or to peripheral devices such as CD-ROM drives, tape drives, and hard drives. SCSI allows connecting the following number and type of devices to a single port by *daisy chaining*:

- ❑ 15 fast, wide SCSI devices (QLA1040/1041/1080/1240/1240D/1280)
- ❑ 15 Ultra SCSI devices (QLA1041/1240D/1280)
- ❑ 15 Ultra2, LVD SCSI devices (QLA1080/1280)
- ❑ 6 Ultra SCSI devices (QLA1040/1240 boards and QLA1080/1280 boards in single-ended mode)

A daisy chain is a series of connections where the first device is connected to the host adapter board, the second device is connected to the first, and so on. A daisy chain can be created by using either a daisy chain cable (one cable with multiple connectors) or by using multiple cables. Each SCSI device must have a unique SCSI ID.

Because SCSI allows the computer to use a standard set of commands to communicate with peripherals, adding a variety of peripherals to your computer using one host adapter board is easy.

**1.2
Features**

- ❑ Compliance with Intel PCI version 2.1 specification
- ❑ Compliance with ANSI X3.131-1994 SCSI-2 standard
- ❑ Compliance with ANSI X3T10/1071D SCSI-3 Fast-20 standard (Ultra SCSI)

- ☐ Compliance with ANSI X3T10/1142D Fast-40 draft (Ultra2 SCSI) (QLA1080/1280 boards)
- ☐ Compliance with U.S. and international safety and emissions standards
- ☐ Support for asynchronous and synchronous transfer modes
- ☐ Synchronous SCSI data transfer rates supported:
 - ☐ Ultra2, LVD SCSI (80 Mbytes/sec) (QLA1080/1280 boards)
 - ☐ Ultra SCSI wide (40 Mbytes/sec) (QLA1040/1240 boards)
 - ☐ Ultra SCSI narrow (20 Mbytes/sec)
 - ☐ Fast SCSI wide (20 Mbytes/sec)
 - ☐ Fast SCSI narrow (10 Mbytes/sec)
 - ☐ SCSI narrow (5 Mbytes/sec)
- ☐ Support for single-ended mode (QLA1040/1080/1240/1280 boards)
- ☐ Support for differential mode (QLA1041/1240D boards)
- ☐ Support for LVD mode (QLA1080/1280 boards)
- ☐ Support for up to 15 SCSI devices (QLA1040/1041 boards)
- ☐ Support for up to 15 LVD SCSI devices (QLA1080)
- ☐ Support for up to 30 LVD SCSI devices (QLA1280)
- ☐ Support for up to 30 SCSI devices (QLA1240/1240D boards)
- ☐ Support for logical unit numbers (LUN) 0-15
- ☐ Support for bus master DMA
- ☐ *Fast!UTIL* Basic Input/Output System (BIOS) utility to customize the configuration parameters on the QLA1xxx board and attached drives
- ☐ Active termination (QLA1040/1080/1240/1280 boards)
- ☐ Active negation (QLA1040/1240 boards; QLA1080/1280 boards in single-ended mode)

1.2.1

Mixed Peripheral Support

- ☐ Support for hard disk, removable disk, optical disk, scanner, tape drive, CD-ROM, and other SCSI devices
- ☐ Simultaneous mixed-peripheral configurations support
- ☐ Bootable device support for disk and CD-ROM
- ☐ DOS advanced SCSI programming interface (ASPI) manager for disk, tape, and other devices

Section 2

Hardware Installation

2.1

Preinstallation Procedures

Before installing your QLA1xxx board, take a moment to read this instruction guide.

CAUTION!

- ❑ Your computer, the QLA1xxx board, and each SCSI device must be configured properly for optimum performance. Refer to the appropriate documentation to configure your computer and SCSI devices.
- ❑ Pay particular attention to the SCSI ID assignment. The QLA1xxx board is set at the factory for SCSI ID 7. **The QLA1xxx board and each SCSI device attached to the board must have different SCSI IDs.**
- ❑ The QLA1xxx boards contain parts that can be damaged by electrostatic discharge (ESD). Before handling the QLA1xxx board, use standard methods to discharge static electricity. Keep the QLA1xxx board in the antistatic bag until you are ready to install it. Place the board on the bag when you examine or configure it. Retain the bag for future use.

2.2

What You Need for Installation

Before you install the QLA1xxx board in your computer, you need the following:

- ☐ A screwdriver (usually a Phillips #1)
- ☐ One or more of the cables listed in table 2-1

Table 2-1. Cables for Installation

QLA1xxx Board	Internal		External	
	Narrow	Wide	Narrow	Wide
QLA1040	50-pin to 50-pin	68-pin to 68-pin	68-pin to 50-pin	68-pin to 68-pin
QLA1041				
QLA1240	68-pin to 50-pin		68-pin VHDC to 50-pin	68-pin VHDC
QLA1240D ^a	N/A	N/A		
QLA1080	68-pin to 50-pin	68-pin to 68-pin		
QLA1280				

Table Notes
All cables are SCSI-2, high density unless otherwise noted.
The 68-pin connectors are high density or very high density (VHDC) unless otherwise noted.
^aThe QLA1240D board supports only external connectors.

Figures 2-1 through 2-6 identify the QLA1xxx board components referenced throughout this section.

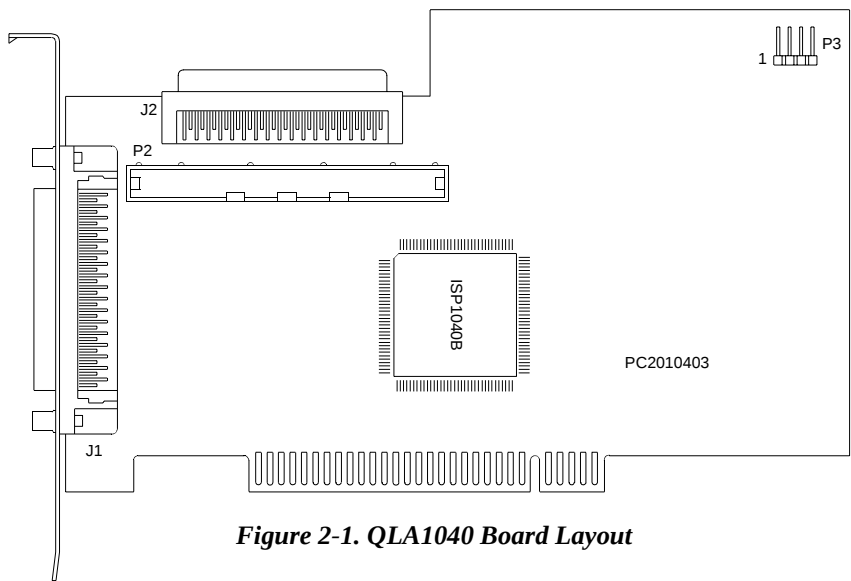


Figure 2-1. QLA1040 Board Layout

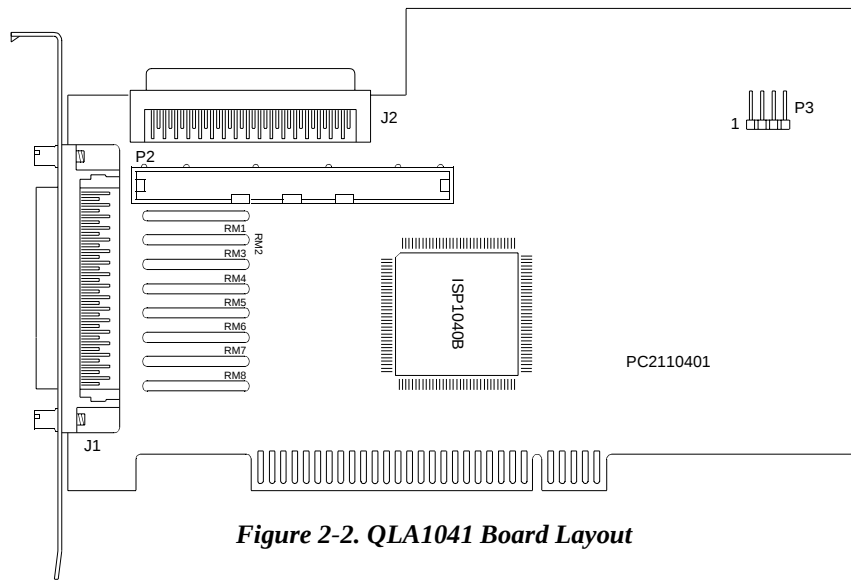


Figure 2-2. QLA1041 Board Layout

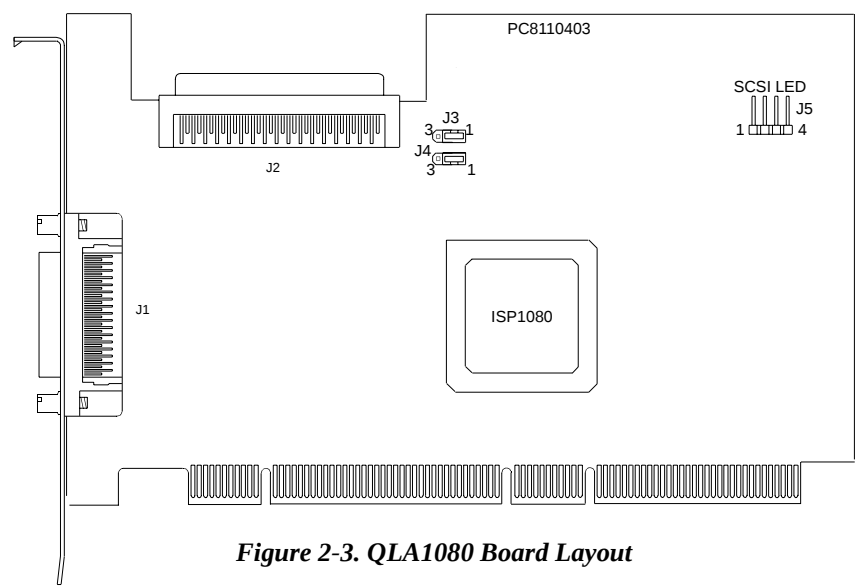


Figure 2-3. QLA1080 Board Layout

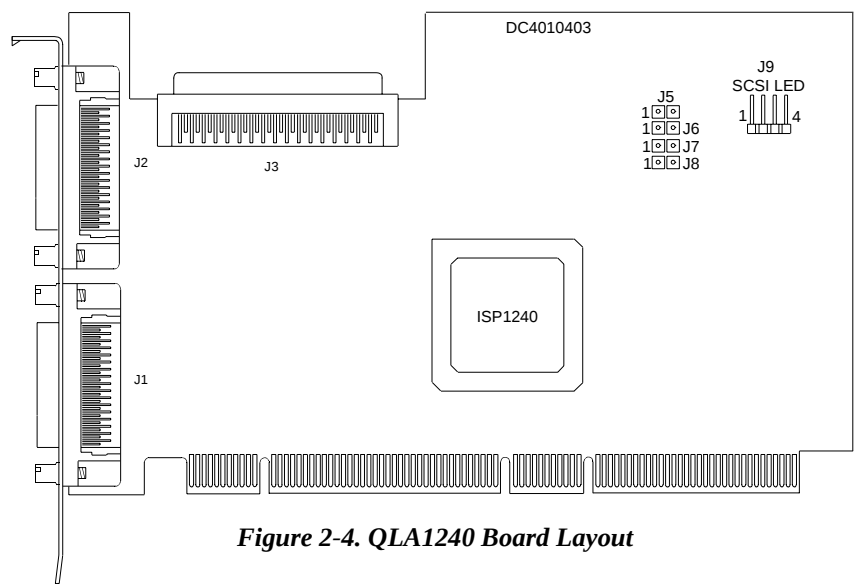


Figure 2-4. QLA1240 Board Layout

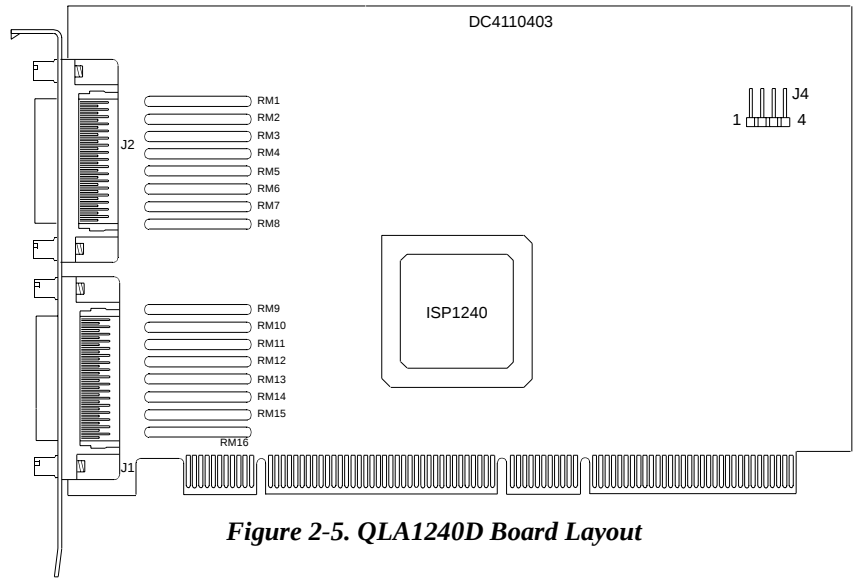


Figure 2-5. QLA1240D Board Layout

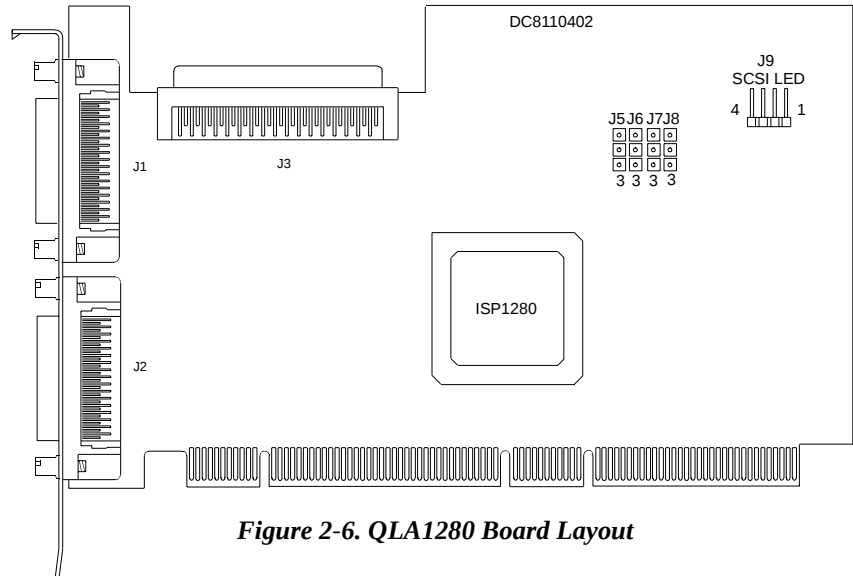


Figure 2-6. QLA1280 Board Layout

2.3

Setting the SCSI Termination

Termination for the QLA1040/1080/1240/1280 boards is set automatically in most cases. You can change the termination using the *Fast!UTIL* software (see section A.2.1).

Termination for the QLA1080/1240/1280 boards can also be set using jumpers (see section B.4 for the QLA1240 board, section B.5 for the QLA1080 board, or section B.6 for the QLA1280 board).

Termination instructions for the QLA1041/1240D boards are in sections B.2 and B.3.

2.4

SCSI Termination Power

The QLA1xxx board supplies termination power to itself and to the SCSI bus. The circuit is protected by a self-restoring fuse.

2.5

Installing the Device Activity Light

If the SCSI disk is assigned as drive C (boot drive), you can connect the device activity light on the front panel of the PC to indicate boot drive activity. Connect the light to the following jumper blocks (pins 1 and 4 are positive):

- ☐ P3 (QLA1040/1041 boards)
- ☐ J9 (QLA1240 board)
- ☐ J5 (QLA1080 board)
- ☐ J4 (QLA1240D board)
- ☐ J9 (QLA1280 board)

If your boot drive is an integrated drive electronics (IDE) drive or connected to a different adapter, you can connect an LED to the QLA1xxx jumper blocks to show activity of devices connected to your QLA1xxx board.

2.6

Installation in the Computer

If you changed the termination on the QLA1xxx board, double-check the new setting prior to installation.

Perform the following steps to install the QLA1xxx board in your PC:

1. Check the motherboard and make any configuration changes necessary to accommodate the QLA1xxx board.

The QLA1xxx board is self-configuring; however, some motherboards require manual configuration. For example, some systems have a *PCI Device Configuration* menu in the motherboard setup BIOS where you must enable host adapter boards, bus master slots, and interrupt request (IRQ) levels. If the motherboard supports triggering, use *level triggering* for the QLA1xxx board. See the documentation supplied with your computer, or contact your computer dealer to determine if your motherboard requires configuration.

2. Power down the peripherals, then the computer.
3. Remove the computer cover and save the screws.
4. Choose any PCI bus slot that supports bus mastering. Most motherboards automatically assign an IRQ level and interrupt line. If your motherboard does not, you must assign the IRQ level and use interrupt line A for this slot.

NOTE: Some motherboards have two kinds of PCI bus slots: master and slave. The QLA1xxx board must be in a PCI bus master slot. (Some motherboards share PCI bus master slots with onboard devices. QLA1xxx boards do not work in shared slots.)

5. Unscrew and remove the slot cover. Retain the screw; you will use it when you install the QLA1xxx board.
6. Place the QLA1xxx board into the slot. Carefully press the board into the slot until it seats firmly.

NOTE: QLA1xxx boards are designed with the components on the opposite side compared to non-PCI boards.

7. Secure the QLA1xxx board with the slot cover screw.

8. Install the cable.

CAUTION! You can use any two of the connectors on the QLA1040/1041 boards (see figures 2-1 and 2-2). Using all three connectors violates the SCSI specification and can cause your peripheral devices to operate incorrectly.

- ❑ Internal: Connect the cable from the devices to the P2 or J2 connector on the QLA1040/1041/1080 boards (see figure 2-7) or the J3 connector on the QLA1240/1280 boards.

NOTE: Make sure you match pin 1 on the 50-pin internal connector with pin 1 (colored stripe) on the ribbon cable.

- ❑ External: Connect a SCSI cable from the devices to the J1 connector (all boards) and/or the J2 connector (QLA1240/1240D/1280 boards).

NOTE: If you are attaching an external device, you must provide your own cable.

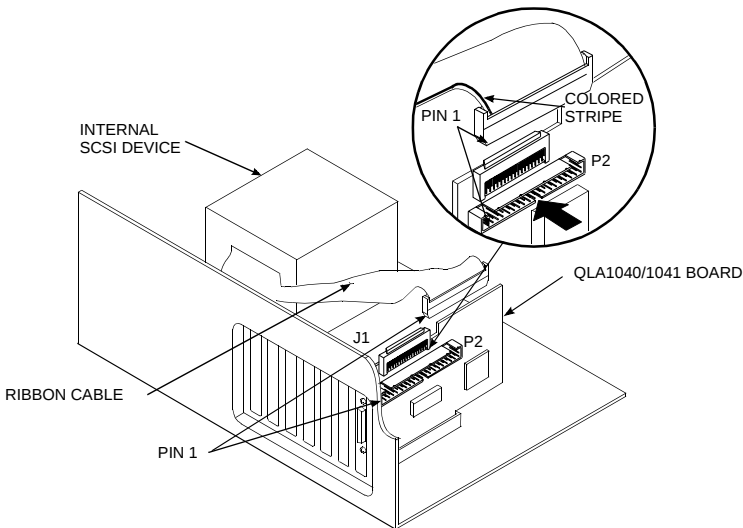


Figure 2-7. Internal SCSI Device and Ribbon Cable

9. Carefully reinstall the computer cover. Insert and tighten the computer cover screws.
10. Power up all external SCSI devices, then power up the PC and observe the monitor. The BIOS lists all SCSI devices attached to the QLA1xxx board. For example:

QLogic Corporation
 PCI SCSI ROM BIOS Version X.XX
 Copyright (C) QLogic Corporation 1997 All rights reserved.

Press <Alt-Q> for Fast!UTIL

Using IRQ number X

Device Number	Device Type	Adapter Number	SCSI ID	SCSI LUN	Vendor ID	Product ID	Product Revision
81	Disk	0	0	0	SEAGATE	ST32550	7394

It is a good idea to write down and store the SCSI device information for future use. You can access the same information using *Fast!UTIL* (see appendix A). This information is helpful for troubleshooting or when you install other devices.

If you don't have a hard drive attached to your computer, a Read-Only Memory Basic Input/Output System (ROM BIOS) NOT INSTALLED message displays after the device listing.

If the information displayed on your monitor is correct (all installed devices are listed with the correct SCSI ID, device type, etc.), congratulations! You have successfully installed the QLA1xxx board in your computer.

See the appropriate QLA1xxx software installation guide for detailed instructions on how to install the software drivers.

If the information displayed is not correct and you have checked the QLA1xxx board's configuration, see section 3 for troubleshooting information.

2.7

Installation Help

If your system has an integrated drive electronics (IDE) fixed disk device, make sure you program the system BIOS to point to the appropriate boot drive. If your system does not have an IDE disk device, the first bootable SCSI disk device configured (the one with the lowest SCSI ID) is assigned device number 80 and is the boot device.

For a motherboard BIOS that does not support SCSI disk booting, you can use settings in *Fast!UTIL* to select the system's boot device attached to the QLA1xxx board. If the boot device is a CD-ROM, see the CDROM Boot setting in table A-1. If the boot device is a disk, see section A.2.4 about selectable boot settings.

SCSI ID numbers must be unique. If not, the BIOS list of SCSI devices displayed on your monitor will not be correct. For example, if you give one of your devices the same SCSI ID as the QLA1xxx board, that device will be listed for all SCSI IDs, or if you have two devices with the same SCSI ID, only one of the devices will be listed. If the BIOS list is not correct, power down the computer and recheck the configuration. Be sure to check the QLA1xxx board, which uses SCSI ID 7. If you do not see your device listed on the BIOS listing, see section 3.

If you do not have an IDE drive, set the motherboard BIOS parameters to None or Not Installed. The ROM BIOS on the SCSI controller automatically configures the SCSI peripherals.

If the QLA1080/1280 boards are on a SCSI bus with any single-ended peripheral device, for example, a CD-ROM, the QLA1080/1280 boards automatically operate as a single-ended, Ultra device. Consequently, all single-ended device restrictions apply to the QLA1080/1280 boards, even though they are LVD devices (see table 3-1 and appendix C).

Section 3

Troubleshooting

3.1

Problems After Installation

There are three basic types of installation problems that can cause your QLA1xxx board to function incorrectly: hardware problems, system configuration problems, and SCSI problems. The following section provides itemized checklists to help you determine why your QLA1xxx board is not functioning.

NOTE: The latest versions of the release notes, software drivers, flash BIOS, and documentation are available on the QLogic web site, <http://www.qlc.com>.

3.2

Hardware Problem Checklist

- ☐ Are all of the circuit cards installed securely in the PC?
- ☐ Are all of the cables securely connected to the correct connectors?
- ☐ Is the QLA1xxx board installed correctly in the PC slot? Is it seated firmly in the slot?
- ☐ Are all external peripherals properly powered up? See section A.3 for information about displaying attached devices.

3.3

System Configuration Problem Checklist

- ☐ Check the motherboard for proper configuration (see section 2.6).
See the documentation supplied with your computer, or contact your computer dealer to determine if your motherboard requires configuration.
- ☐ If the system message *Missing Operating System* or *No ROM BASIC, System Halted* appears, the disk drive attached to the QLA1xxx board is not partitioned in a format compatible with the board. The proper geometry for use with the QLA1xxx boards is the Microsoft standard.
 - ☐ Drives less than one gigabyte are 64 heads, 32 sectors per track
 - ☐ Drives greater than one gigabyte are 255 heads, 63 sectors per track

If the drive is not formatted with this geometry, repartition and format the drive using the DOS FDISK and FORMAT utilities.

3.4
SCSI Problem Checklist

- ❑ Make sure that the SCSI bus termination for the QLA1xxx board is set correctly (see appendices A and B).
- ❑ Make sure that the termination for all devices on the SCSI bus is set correctly.
- ❑ Were all of the SCSI devices powered up before you powered up the PC?
- ❑ Does each device have a unique SCSI ID? Each device must have its own unique ID between 0 and 15. The QLA1xxx board is set for SCSI ID 7 at the factory.
- ❑ Check the cable lengths. Make sure that the total length for the cables connected to the QLA1xxx board doesn't exceed the limits listed in table 3-1.

Table 3-1. Maximum Cable Length

Board and Mode	Cable Length
QLA1040/1240, Ultra mode	9.8 feet (3 meters) ^a 4.9 feet (1.5 meters) ^b
QLA1040/1240, non-Ultra mode	19.7 feet (6 meters)
QLA1041/1240D, Ultra or non-Ultra mode	82 feet (25 meters)
QLA1080/1280 point to point 15 nodes single-ended Ultra mode	25 meters 12 meters 9.8 feet (3 meters) ^a 4.9 feet (1.5 meters) ^b

Table Notes

If you are mixing Ultra and non-Ultra SCSI devices, the total length of the cables cannot exceed the maximum cable length established for Ultra SCSI devices.

^aFor four or less devices connected to the board.

^bFor five to eight devices connected to the board.

Appendix A

Fast!UTIL

A.1

Introduction

This appendix provides detailed configuration information for advanced users who want to customize the configuration of the QLA1xxx board and the connected devices.

The QLA1xxx board is configured at the factory to provide maximum performance. When your board is operating at maximum performance, it may not be 100% compatible with some older SCSI-1 devices. If you are using a SCSI-1 device, see section A.5 for more information.

The board can be configured using *Fast!UTIL*. Access *Fast!UTIL* by pressing <ALT>-<Q> during the QLA1xxx board BIOS initialization (it may take a few seconds for the *Fast!UTIL* menu to appear). If you have more than one QLA1xxx board, *Fast!UTIL* asks you to select the board you want to configure. After changing the settings, *Fast!UTIL* reboots your system to load the new parameters.

CAUTION! If the configuration settings are incorrect, your QLA1xxx board will not function properly.

The following sections describe the *Fast!UTIL* options.

A.2

Configuration Settings

The first selection on the *Fast!UTIL Options* menu is *Configuration Settings*. These settings configure the SCSI devices and the QLA1xxx board to which they are attached.

A.2.1
Host Adapter Settings

From the *Configuration Settings* menu in *Fast!UTIL*, select Host Adapter Settings. The default settings for the QLA1xxx host adapter board are listed in table A-1 and described in the following paragraphs.

Table A-1. Host Adapter Settings

Setting	Options	Default
Host adapter	<i>Enabled or Disabled</i>	<i>Enabled</i>
Host adapter BIOS	<i>Enabled or Disabled</i>	<i>Enabled</i>
Host adapter SCSI ID	<i>0-15</i>	<i>7</i>
PCI bus DMA burst	<i>Enabled or Disabled</i>	<i>Enabled</i>
CDROM Boot	<i>Enabled or Disabled</i>	<i>Disabled</i>
SCSI bus reset	<i>Enabled or Disabled</i>	<i>Enabled</i>
SCSI bus reset delay	<i>0-15 seconds</i>	<i>5 seconds</i>
Concurrent command/data	<i>Enabled or Disabled</i>	<i>Enabled</i>
Drivers load RISC code	<i>Enabled or Disabled</i>	<i>Enabled</i>
Adapter Configuration	<i>Auto, Manual, Safe</i>	<i>Auto</i>
SCSI termination ^a	<i>Auto, Enabled^b, Disabled, High only</i>	<i>Auto</i>

Table Notes

^aSCSI termination does not apply to the QLA1041/1240D boards (see appendix B).

^bThis option does not apply to the QLA1240 board.

- ☐ **Host adapter.** When this setting is enabled, the system BIOS and drivers recognize the QLA1xxx board. When this setting is disabled, the BIOS and drivers ignore the board. The default is *Enabled*.
- ☐ **Host adapter BIOS.** When this setting is disabled, the ROM BIOS on the QLA1xxx board is disabled, freeing space in upper memory. The RAM BIOS and other drivers still recognize the QLA1xxx board. Do not disable this setting if you are booting from a SCSI disk drive attached to the QLA1xxx board. The default is *Enabled*.
- ☐ **Host adapter SCSI ID.** This setting defines the SCSI ID of the QLA1xxx board. The default is *SCSI ID 7*.

- ❑ **PCI bus DMA burst.** When this setting is enabled, burst transfers are performed. When this setting is disabled, data is transferred in nonburst mode, with each cycle initiated by a new address phase. The default is *Enabled*.
- ❑ **CDROM Boot.** When this setting is enabled, the ROM BIOS boots from the attached SCSI CD-ROM if a bootable compact disk is installed. If no bootable CD-ROM is found, the system boots from the first bootable SCSI drive. When this setting is disabled, the ROM BIOS does not boot from the CD-ROM. The default is *Disabled*.
- ❑ **SCSI bus reset.** This setting enables or disables resetting the SCSI bus when the system is powered up. The default is *Enabled* (the SCSI bus is reset at system power up). Disable this setting when you have two or more host adapter boards on the SCSI bus to prevent unwanted SCSI bus resets.
- ❑ **SCSI bus reset delay.** After resetting the SCSI bus, the firmware does not initiate any SCSI activity for the number of seconds specified in this setting. The default is five seconds.
- ❑ **Concurrent command/data.** When this setting is enabled, both the data DMA and the command DMA execute concurrently. When this setting is disabled, either the data DMA or the command DMA is operational. To maximize bus transfer performance, the default is *Enabled*.

NOTE: This setting is not available and has no effect on older versions of the ISP chip.

- ❑ **Drivers load RISC code.** When this setting is enabled, the host adapter uses the RISC firmware that is embedded in the software driver. When this setting is disabled, the software driver loads the latest version of RISC firmware found on the system. The default is *Enabled*.

NOTE: The driver being loaded must support this setting. If the driver does not support this setting, the result is the same as disabled regardless of the setting. Leaving this option enabled guarantees a certified combination of software driver and RISC firmware.

❑ Adapter Configuration

- ❑ *Auto* (default). The ROM BIOS automatically configures the QLA1xxx board to match any SCSI device attached to the board and selects optimum performance.
- ❑ *Manual*. You can manually control the configuration settings for each SCSI device. If you choose *Manual*, you have the option of running *Autoconfigure* (see section A.2.3) to have *Fast!UTIL* configure the devices.

NOTE: Changing any value can cause performance problems or incorrect device operation.

- ❑ *Safe*. All optimal configuration settings are turned off and all attached devices work in minimal configuration (narrow, asynchronous mode).

NOTE: *Safe* mode is primarily for troubleshooting SCSI devices that are not operating properly during normal system operation.

❑ SCSI termination (QLA1040)

NOTE: The last SCSI device on each end of the SCSI bus must be terminated.

- ❑ *Auto* (default). SCSI termination requirements are sensed by the board and set automatically. For example, if you have devices connected to J1, J2, or P2, termination is enabled. If you have wide devices connected to J1 and J2 or P2, termination is disabled.
- ❑ *Disabled*. SCSI termination is disabled. This setting overrides termination requirements sensed by the board. Use this setting when J1 or J2 is not at one end of the SCSI bus. For example, use this setting if you have wide devices daisy chained to J1 or J2 with a single cable and J1 or J2 is not at the end of the cable.
- ❑ *Enabled*. SCSI termination is enabled. This setting overrides termination requirements sensed by the board. Use this setting when you have wide devices connected to J1, J2 or P2 (same result as using *Auto*).
- ❑ *High only*. High termination is enabled. This setting overrides termination requirements sensed by the board. Use this setting when you have a wide device connected to one connector (J1, J2 or P2) and a narrow device connected to the other.

☐ **SCSI termination** (QLA1080/1240/1280)

Termination for the QLA1080/1240/1280 boards can be set in one of three ways:

- ☐ Automatic (default)
- ☐ Manual (through *Fast!UTIL*)
- ☐ Jumpers

NOTE: The last SCSI device on each end of the SCSI bus must be terminated.

The QLA1240/1280 boards are dual port host adapters. Each port is a separate SCSI bus and must be terminated independently. The port one and two connectors are as follows:

QLA1240 board:

- ☐ Port one: J2 and J3
- ☐ Port two: J1

QLA1280 board:

- ☐ Port one: J1 and J3
- ☐ Port two: J2

The following text explains automatic and manual termination. See sections B.4 (QLA1240), B.5 (QLA1080), and B.6 (QLA1280) for jumper termination instructions.

- ☐ *Auto* (default). SCSI termination requirements are sensed by the board and set automatically.

With the QLA1240/1280 boards, the Auto setting assumes that port one is at one end of the SCSI bus and enables termination for port one. If you are using only one port one connector, the Auto setting assumes that port one is at the end of the SCSI bus and enables termination for port one. If you have devices connected to both port one connectors, the Auto setting disables termination for port one.

- ☐ *Disabled*. SCSI termination is disabled. This setting overrides termination requirements sensed by the board. Use this setting when J2, J1, or J3 (QLA1240/1280 boards) is not at one end of the SCSI bus. For example, use this setting if you have wide devices daisy chained to the QLA1240/1280 J1, J2, or J3 connector with a single cable and the J1, J2, or J3 connector is not at the end of the cable.

- ☐ *Enabled* (QLA1080). SCSI termination is enabled. This setting overrides termination requirements sensed by the board. Use this setting for the QLA1080 board when you have a wide device connected to J1 or J2.
- ☐ *High only*. High termination is enabled. This setting overrides termination requirements sensed by the board.

Use this setting for the QLA1080 board when you have a wide device connected to one connector and a narrow device connected to the other.

Use this setting for the QLA1240/1280 boards’ port one when you have a wide device connected to one connector and a narrow device connected to the other connector. Use this setting for the QLA1240/1280 boards’ port two if the port two connector is not at one end of the SCSI bus and you have narrow devices at one end of the bus and wide devices at the other end.

A.2.2
SCSI Device Settings

After changing the host adapter settings for the QLA1xxx board, you can modify the device parameters for SCSI devices connected to the board. From the *Configuration Settings* menu in *Fast!UTIL*, select *SCSI Device Settings*. The settings are linked to the device’s SCSI ID (0-15). If you make changes, be sure the SCSI ID matches the device whose settings you want to change. Select *Scan SCSI Bus* from the *Fast!UTIL Options* menu to see the SCSI IDs assigned on your system (see section A.3).

NOTE: The Adapter Configuration setting in the Host Adapter Settings (see section A.2.1) controls which device settings you can change.

The options and defaults for the SCSI device settings are listed in table A-2 and described in the following paragraphs.

Table A-2. SCSI Device Settings

Setting	Options	Default	Adapter Configuration Setting
Disconnects OK	<i>Yes or No</i>	<i>Yes</i>	<i>Auto, Safe, Manual</i>
Check Parity	<i>Yes or No</i>	<i>Yes</i>	<i>Auto, Safe, Manual</i>
Enable LUNs	<i>Yes or No</i>	<i>Yes</i>	<i>Auto, Safe, Manual</i>
Enable Device	<i>Yes or No</i>	<i>Yes</i>	<i>Manual</i>
Negotiate Wide	<i>Yes or No</i>	<i>Yes</i>	<i>Manual</i>

Table A-2. SCSI Device Settings (Continued)

Setting	Options	Default	Adapter Configuration Setting
Negotiate Synchronous	<i>Yes or No</i>	<i>Yes</i>	<i>Manual</i>
Tagged Queuing	<i>Yes or No</i>	<i>Yes</i>	<i>Manual</i>
Sync Offset	<i>00, 02, 04, 06, 08, 12</i>	<i>08</i>	<i>Manual</i>
Sync Period			
QLA1040/1041/1240/1240D	<i>10, 12, 25, 50</i>	<i>12</i>	<i>Manual</i>
QLA1080/1280	<i>10, 12, 25, 40</i>	<i>12</i>	<i>Manual</i>
Exec Throttle	<i>1, 4, 8, 16, 32, 64, 128, 255</i>	<i>16</i>	<i>Auto, Safe, Manual</i>

NOTE: These settings apply to each SCSI ID individually.

- ☐ **Disconnects OK.** When set to *Yes*, the device is notified that it can optionally disconnect from the host adapter. When the drive is ready to continue executing the command, it must reestablish the link through a reconnect cycle. When set to *No*, disconnects are not allowed. The default is *Yes*.

If you have more than one device attached to the QLA1xxx board, set Disconnects OK to *Yes* for best performance.

- ☐ **Check Parity.** When set to *Yes*, odd parity is checked and passed to the SCSI FIFO when data is received from the SCSI bus. When set to *No*, the received SCSI parity is ignored and odd parity is generated for the SCSI FIFO. The default is *Yes*.
- ☐ **Enable LUNs.** When set to *Yes*, multiple LUNs are supported. When set to *No*, multiple LUNs are not supported. LUN support is typically required for CD-ROM changers or redundant array of independent disks (RAID) boxes that use LUNs to map drives. The default is *Yes*.
- ☐ **Enable Device.** When set to *Yes*, the system BIOS recognizes the device at this SCSI ID. When set to *No*, the system BIOS ignores the device at this SCSI ID. The default is *Yes*.
- ☐ **Negotiate Wide.** When set to *Yes*, the device supports 16-bit, wide (68-pin cable) SCSI data transfers. When set to *No*, only 8-bit (50-pin cable) SCSI data transfers are supported. The default is *Yes*.
- ☐ **Negotiate Synchronous.** When set to *Yes*, the QLA1xxx board negotiates synchronous data transfers with the device. When set to *No*, the QLA1xxx board only uses asynchronous data transfers. The default is *Yes*.

- ❑ **Tagged Queuing.** When set to *Yes*, the device queues multiple commands. When set to *No*, multiple queues are not supported. The default is *Yes*.
- ❑ **Sync Offset.** This field specifies the maximum number of requests (REQ) that can be sent during a synchronous data transfer before an acknowledge (ACK) is received. The valid values for this field are: *00, 02, 04, 06, 08, 10, and 12*. The default is *08*.
- ❑ **Sync Period.** This field specifies the minimum REQ/ACK period (in 4-ns increments) for a synchronous data transfer. The valid values for this field are listed in table A-3. The default is 10 for the QLA1080/1280 or 12 for the QLA1040/1041/1240/1240D.

Table A-3. Sync Period Settings

Sync Period Setting	Transfer Rate (Mbytes/sec)	Board
10 ^a	80 (LVD SCSI)	QLA1080/1280
12 ^b	40 (Ultra SCSI)	All
25	20 (Fast SCSI)	All
40	12.5	QLA1080/1280
50	10	QLA1040/1041/1240/1240D

Table Notes

^aDefault setting for the QLA1080/1280

^bDefault setting for the QLA1040/1041/1240/1240D

- ❑ **Exec Throttle.** This field specifies the maximum number of commands executing on any one port. When a port’s execution throttle is reached, no new commands are executed until the current command finishes executing. The valid values for this field are: *1, 4, 8, 16, 32, 64, 128, and 255*. The default is *16*.

A.2.3

Scan and Configure SCSI Devices

NOTE: You must set the Adapter Configuration setting in the Host Adapter Settings to *Manual* (see section A.2.1) to use Autoconfigure; otherwise, all changes made with Autoconfigure are reset when your system is rebooted.

The QLA1xxx board is designed to sense and configure the devices connected to your board. With the Adapter Configuration set to *Manual*, the Autoconfigure option gives you control of when the bus is scanned and configured. Selecting the

The *Autoconfigure SCSI Devices* option from the Configuration Settings menu causes the QLA1xxx board to scan the devices on the SCSI bus and set the following options, based on the capabilities of each device:

- ☐ Enable Device
- ☐ Disconnects
- ☐ Negotiate Wide
- ☐ Negotiate Synchronous
- ☐ Tagged Queuing
- ☐ Enable LUN Support

The settings are displayed in the *SCSI Device Settings* screen. Use the arrow keys to change the settings. See section A.2.2 for more information about the SCSI device settings and section A.2.1 for host adapter settings.

If you use Autoconfigure to configure your system, you should run *Fast!UTIL* and select *Autoconfigure SCSI Devices* after adding or reconfiguring devices attached to the QLA1xxx board.

A.2.4

Selectable Boot Settings

The *Selectable Boot Settings* option is accessed from the *Configuration Settings* menu. If you enable this option, you can select the SCSI ID from which you want to boot. SCSI ID values range from 0-15. Once enabled, this option forces the system to boot on the selected SCSI drive, ignoring any IDE drives attached to your system. If you disable this option, the system looks for an IDE drive from which to boot. If an IDE drive is not found, the system looks for the first bootable SCSI drive. In disabled mode, the SCSI Boot ID and SCSI Boot LUN parameters have no effect.

NOTE: This option applies only to disk devices; it does not apply to CD-ROMs, tape drives, and other nondisk devices.

A.2.5

Restore Default Settings

The *Restore Defaults* option from the *Configuration Settings* menu restores the QLA1xxx board default settings. The default settings are displayed on the *SCSI Device Settings* screen. Use the arrow keys to change the settings. See section A.2.2 for more information about the SCSI device settings and section A.2.1 for host adapter settings.

A.2.6

Raw NVRAM Data

This option displays the adapter's NVRAM contents in hexadecimal format. This is a troubleshooting tool; you cannot modify the data.

A.3

Scan SCSI Bus

This option scans the SCSI bus and lists all the connected devices by SCSI ID. Information about each device is listed, for example, vendor name, product name, and revision. This information is useful when configuring your QLA1xxx board and attached devices.

A.4

SCSI Disk Utility

This option scans the SCSI bus and lists all the connected devices by SCSI ID. You can select a disk device and perform a low-level format or verify the disk media.

CAUTION! Performing a low-level format destroys all data on the disk.

A.5

Using SCSI-1 Devices

The QLA1xxx board is configured at the factory with default parameters that provide maximum performance. When the board is operating at maximum performance, it may not be 100% compatible with some older SCSI-1 devices.

If the SCSI-1 device attached to the QLA1xxx board is having problems, you can turn off some of the high-performance parameters to get maximum compatibility. Follow these steps:

1. When you power up the system, access *Fast!UTIL* with the <ALT>-<Q> key combination.
2. Select *Host Adapters Settings*.
3. Change the *Adapter Configuration* to *Manual*.
4. Press the <ESC> key to return to the *Fast!UTIL Options* menu.
5. Select *Configuration Settings* from the *Fast!UTIL Options* menu.

6. Select SCSI Device Settings. A screen appears with the settings for each SCSI device. Make the following changes for each SCSI ID to which a SCSI-1 device is assigned.
 - a. Change the *Negotiate Wide* setting to *No*.
 - b. Save the parameters.
 - c. Exit from *Fast!UTIL*.
 - d. Reboot your system.
7. If your SCSI device is still having problems, repeat steps 1 through 6. In step 6, change the following parameters to *No*, one at a time, rebooting after each change to check your system's performance.
 - a. Negotiate Synchronous
 - b. Check Parity
 - c. Enable LUNs
 - d. Disconnects OK

When the system operates correctly, stop changing the parameters!

If you've changed all parameters in steps 6 and 7 and things still aren't working right, follow these steps.

1. When you power up the system, access *Fast!UTIL* with the <ALT>-<Q> key combination when the BIOS banner appears.
2. Select *Configuration Settings* from the *Fast!UTIL Options* menu.
3. Select *Host Adapter Settings*.
4. Change the PCI bus DMA burst setting to *Disable*.
5. Exit from *Fast!UTIL*.
6. Reboot your system.

If your devices are still not working properly, change the Adapter Configuration settings in the Host Adapter Settings to *Safe* (see section A.2.1).

Appendix B

SCSI Termination

B.1

Setting the SCSI Termination

The first and last physical SCSI devices on each end of the SCSI bus must be terminated. Termination for the QLA1041/1240D boards is controlled by a set of resistors (terminators) labeled RM1-RM8 for the QLA1041 (see figure B-1) and RM1-RM16 for the QLA1240D (see figure B-5).

Termination for the QLA1040/1080/1240/1280 boards is set automatically or manually through *Fast!UTIL* (see section A.2.1). The QLA1080/1240/1280 boards offer the additional option of terminating with jumpers (see sections B.4, B.5, and B.6).

Some cables have multiple connectors for connecting several devices to one of the board's connectors. If the board uses a connector that is **not** on either end of the cable, then the board is not at one end of the SCSI bus and you need to change the termination setting. See section B.2 for the QLA1041 board and section B.3 for the QLA1240D board.

The QLA1041/1240/1240D boards support 8-bit (narrow) and 16-bit (wide) SCSI devices. If you don't know whether your device is 8-bit (50-pin cable) or 16-bit (68-pin cable), check with the peripheral manufacturer.

The following sections describe how to set termination for the QLA1041/1080/1240/1240D/1280 boards. The text and illustrations describe multiple SCSI devices daisy chained onto a single connector on the board. When daisy chaining narrow and wide SCSI devices, always have a wide SCSI device at the end of the chain.

B.2

Termination (Resistors) for the QLA1041

The QLA1041 board comes from the factory with termination enabled.

- ❑ If you are using only one of the board's connectors and the board is at one end of the SCSI bus, no changes are necessary.
- ❑ If the board is not at one end of the SCSI bus or you are using **two** of the board's connectors, change the termination setting as follows (see figure B-1):

CAUTION! You can use any two of the connectors on the board. Using all three connectors violates the SCSI specification and can cause your peripheral devices to operate incorrectly.

- ❑ If you have wide devices on the J1 and J2 connectors (see figure B-4), remove all the terminators (RM1-RM8).
- ❑ For all other combinations, remove the RM4-RM8 terminators.

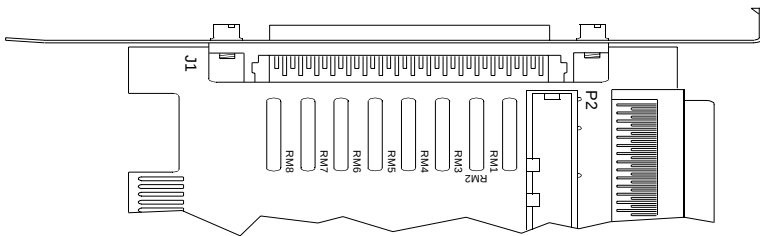


Figure B-1. QLA1041 Terminators

Remove the terminators by firmly grasping a single terminator and carefully pulling it straight up from the board. Retain the terminators for future use.

Figures B-2 through B-4 show some of the possible configurations for the QLA1041 board.

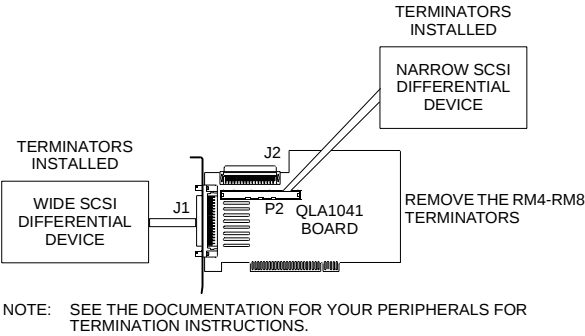


Figure B-2. Termination with J1 and P2 Connectors

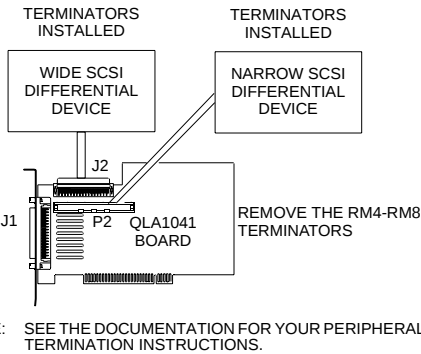


Figure B-3. Termination with J2 and P2 Connectors

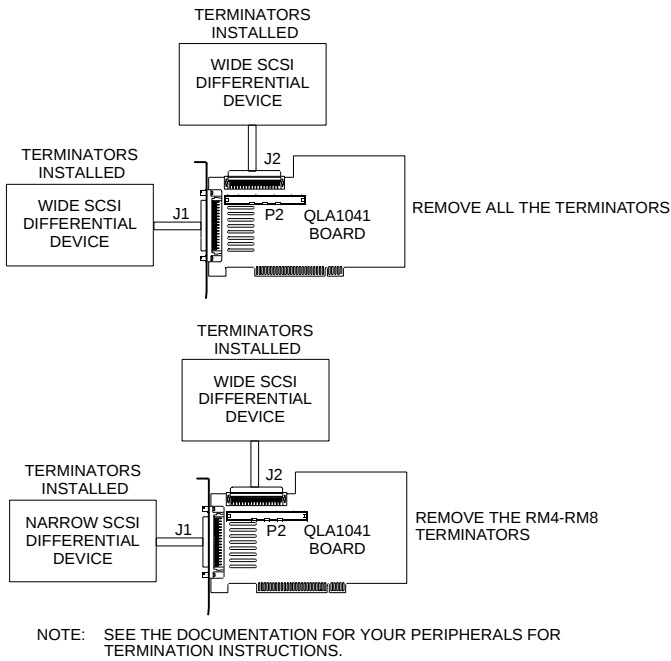


Figure B-4. Termination with J1 and J2 Connectors

B.3 Termination (Resistors) for the QLA1240D

Termination for J1 and J2 is set independently; each is considered a separate SCSI bus. If only wide peripheral devices are connected to the QLA1240D board and the board is at one end of the SCSI bus, no changes are necessary. If you are connecting narrow SCSI devices or the board is not at one end of the bus, change the termination as follows (see figure B-5):

- ☐ Connecting narrow SCSI devices when the QLA1240D board is at one end of the bus
 - ☐ Remove terminators RM1, RM7, and RM8 for J2.
 - ☐ Remove terminators RM9, RM11, and RM15 for J1.

- ☐ Connecting narrow or wide SCSI devices when the QLA1240D board is not at one end of the bus
- ☐ Remove terminators RM1-RM8 for J2.
- ☐ Remove terminators RM9-RM16 for J1.

Remove the terminators by firmly grasping a single terminator and carefully pulling it straight up from the board. Retain the terminators for possible future use.

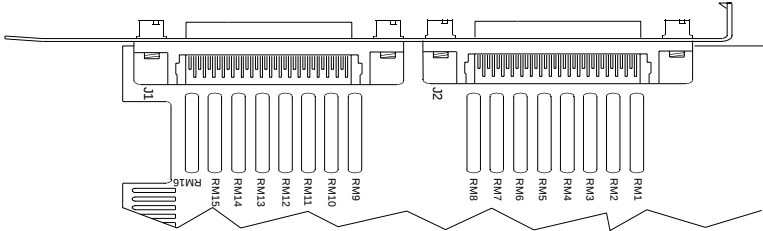


Figure B-5. QLA1240D Terminators

B.4

Termination (Jumpers) for the QLA1240

In most cases, termination should be set automatically (see section A.2.1). Jumpers J5-J8 on the QLA1240 board manually set the termination (see figure B-6). Settings you make with these jumpers override all *Fast!*/UTIL or automatic termination settings.

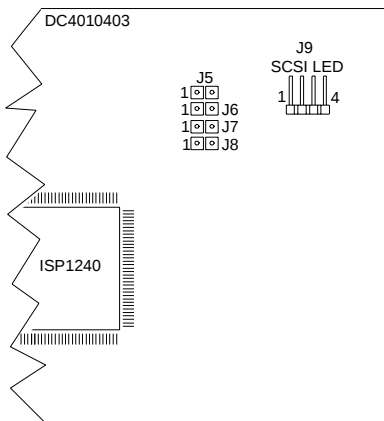


Figure B-6. QLA1240 Jumper Termination

The QLA1240 is a dual port host adapter. Each port is a separate SCSI bus and must be terminated independently. Port one uses connectors J2 and J3; port two uses connector J1. The following text gives some of the possible cases where you would set the termination with jumpers instead of letting the QLA1240 board set it automatically. The default setting for all jumpers is open (no jumpers installed), termination enabled. With no jumpers installed, the board is configured automatically or configured by the settings you make in *Fast!UTIL*.

- ☐ J7 and J8 (see figure B-6) set the termination on port one.
 - ☐ Placing a jumper on J8 disables termination. Use this setting when port one is not at one end of the SCSI bus. For example, use this setting if you have wide devices daisy chained to the J2 or J3 connector with a single cable and J2 or J3 is not at the end of the cable.
 - ☐ Placing a jumper on J7 enables high termination (same as *High only* in *Fast!UTIL*). Use this setting for port one when you have a wide device connected to one connector and a narrow device connected to the other.
 - ☐ Placing jumpers on J7 and J8 has the same effect as placing a jumper on only J8.
- ☐ J5 and J6 (see figure B-6) set the termination on port two.
 - ☐ Placing a jumper on J6 disables termination. Use this setting when port two is not at one end of the SCSI bus. For example, use this setting if you have wide devices daisy chained to the QLA1240 J1 connector with a single cable and J1 is not at the end of the cable.
 - ☐ Placing a jumper on J5 enables high termination (same as *High only* in *Fast!UTIL*). Use this setting for port two if J1 is not at one end of the SCSI bus and you have narrow devices connected to one end of the bus and wide devices connected to the other end.
 - ☐ Placing jumpers on J5 and J6 has the same effect as placing a jumper on only J6.

B.5

Termination (Jumpers) for the QLA1080

The QLA1080 board comes from the factory with jumpers on pins 1-2 of J3 and J4; these settings allow automatic termination (see section A.2.1).

Moving the jumpers on J3 and J4 on the QLA1080 board manually sets the termination (see figure B-7). Settings you make with these jumpers override all *Fast!UTIL* or automatic termination settings.

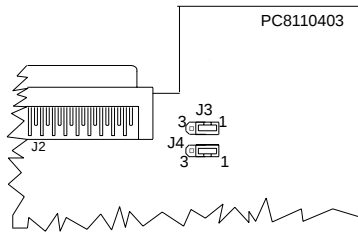


Figure B-7. QLA1080 Jumper Termination

The following paragraphs give manual termination instructions.

- ☐ Termination disabled. Removing the jumpers from J3 and J4 disables termination. Use this configuration if you have wide devices daisy chained to J1 or J2 with a single cable and J1 or J2 is not at the end of the cable.
- ☐ Termination enabled. Putting jumpers on pins 2-3 of J3 and J4 enables termination. Use this setting when you have a wide device connected to J1 or J2.
- ☐ High only. Putting a jumper on pins 2-3 of J4 and removing the jumper from J3 enables high termination. Use this setting when you have a wide device connected to one connector and a narrow device connected to the other.

B.6

Termination (Jumpers) for the QLA1280

The QLA1280 board comes from the factory with jumpers on pins 1-2 of J5, J6, J7, and J8; these settings allow automatic termination (see section A.2.1).

Moving the jumpers on J6 and J8 on the QLA1280 board manually sets the termination for port one. Moving the jumpers on J5 and J7 on the QLA1280 board manually sets the termination for port two (see figure B-8). Settings you make with these jumpers override all *Fast!UTIL* or automatic termination settings.

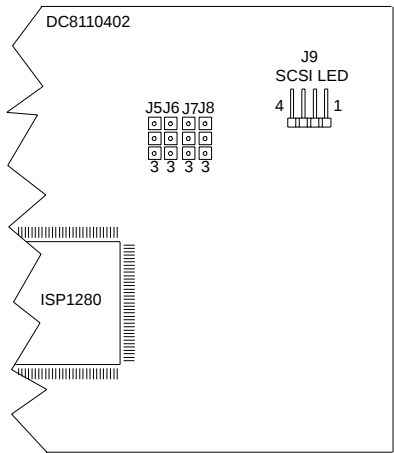


Figure B-8. QLA1280 Jumper Termination

The following paragraphs give manual termination instructions.

- ☐ Termination disabled. Removing the jumpers from J5 and J6 disables termination for port one. Use this configuration if you have wide, LVD devices attached to J1 and J3. Removing the jumpers from J7 and J8 disables termination for port two.
- ☐ Termination enabled. Putting jumpers on pins 2-3 of J5 and J6 enables termination for port one. Use this setting when you have a wide device connected to J1 or J3. Putting jumpers on pins 2-3 of J7 and J8 enables termination for port two. Use this setting when you have a wide device connected to J2.
- ☐ High only. Putting a jumper on pins 2-3 of J6 and removing the jumper from J5 enables high termination for port one. Use this setting when you have a narrow device connected to J1 and a wide device connected to J3, or vice versa. Putting a jumper on pins 2-3 of J7 and removing the jumper from J8 enables high termination for port two.

Appendix C

Specifications

Table C-1. QLA1xxx Board Operating Environment

Environment	Minimum	Maximum
Operating temperature	0°C/32°F	55°C/131°F
Storage temperature	-20°C/-4°F	70°C/158°F
Relative humidity (noncondensing)	10%	90%
Storage humidity (noncondensing)	5%	95%

Table C-2. QLA1xxx Board Specifications

Type	Specification
Host bus	Conforms to PCI Local Bus Rev. 2.1 specification
SCSI standard	ANSI X3.131-1994 SCSI-2 ANSI X3T10/1071D SCSI-3 Fast-20 (Ultra SCSI) ANSI X3T10/1142D Fast-40 draft (Ultra2 SCSI) (QLA1080/1280 boards)
SCSI data handling	Synchronous: Wide and Ultra SCSI (40 Mbytes/sec) Narrow Ultra SCSI (20 Mbytes/sec) Ultra2, LVD SCSI (80 Mbytes/sec) (QLA1080/1280 boards) Wide and fast SCSI (20 Mbytes/sec) Narrow fast SCSI (10 Mbytes/sec) Narrow SCSI (5 Mbytes/sec) Asynchronous (all boards)
Central processing unit (CPU)	Embedded RISC processor
Host data transfer	QLA1040/1041: 32-bit, bus master DMA data transfers to 132 Mbytes/sec QLA1080/1240/1240D/1280: 64-bit, bus master DMA data transfers to 264 Mbytes/sec
Transfer counter	24-bit
RAM	QLA1040/1041: 64K bytes of static RAM per SCSI channel QLA1080/1240/1240D/1280: 128K bytes of static RAM

Table C-2. QLA1xxx Board Specifications (Continued)

Type	Specification
FIFO	QLA1040/1041: 218-byte DMA FIFO per channel with threshold control QLA1080/1280: 128-byte command DMA FIFO; 512-byte data DMA FIFO with threshold control QLA1240/1240D: 512-byte DMA FIFO per channel with threshold control
Electrical drivers	QLA1040/1240: single-ended QLA1041/1240D: differential QLA1080: single-ended and LVD QLA1280: single-ended and LVD
Connectors	QLA1040 and QLA1041 boards: 68-pin, high-density, external SCSI-2 connector 68-pin, high-density, internal SCSI-2 connector 50-pin internal ribbon connector QLA1080 board: 68-pin internal SCSI-2 connector 68-pin external VHDC QLA1240 and QLA1280 boards: 68-pin, high-density, internal SCSI-2 connector Two 68-pin, external VHDCs QLA1240D board: Two 68-pin, external VHDCs
Form factor	17.78cm x 10.67cm (7.0" x 4.2")
Operating power	5 volts @ 1 ampere (QLA1040/1080) 5 volts @ 1.5 ampere (QLA1041) 5 volts @ 3 ampere (QLA1240/1240D/1280)